

WHAT IS CLAIMED IS:

1. A fuel injection control system, comprising:

    a piezo injector having a nozzle portion and a piezo element, wherein the nozzle portion opens when the piezo element is charged and closes when the piezo element is discharged;

    fuel pressure detecting means for detecting fuel pressure corresponding to fuel injection pressure;

    charging amount changing means for changing an upper limit value of charging voltage to the piezo element in accordance with the fuel pressure detected by the fuel pressure detecting means; and

    injection period determining means for calculating a command injection period at least based on command injection quantity, which is set in accordance with an operating state or operating condition of an engine, and the upper limit value of the charging voltage changed by the charging amount changing means.

2. The fuel injection control system as in claim 1, wherein the injection period determining means includes injection period correcting means for contracting the command injection period as the upper limit value of the charging amount to the piezo element changed by the charging amount changing means increases so that actual injection quantity, actual injection end timing or actual valve closing timing of the nozzle portion is unchanged even if the upper limit value

of the charging voltage to the piezo element is changed.

3. The fuel injection control system as in claim 1 or 2, wherein

the charging amount changing means increases or decreases the charging amount to the piezo element in accordance with the fuel pressure by changing target energy charged to the piezo element in accordance with the fuel pressure detected by the fuel pressure detecting means when the charging amount changing means changes the upper limit value of the charging voltage to the piezo element.

4. A fuel injection control system, comprising:

a piezo injector having a nozzle portion and a piezo element, wherein the nozzle portion opens when the piezo element is charged and closes when the piezo element is discharged;

fuel pressure detecting means for detecting fuel pressure corresponding to fuel injection pressure;

charging amount changing means for changing charging speed and an upper limit value of charging voltage to the piezo element in accordance with the fuel pressure detected by the fuel pressure detecting means;

injection period determining means for calculating a command injection period at least based on command injection quantity, which is set in accordance with an operating state or operating condition of an engine, and the charging speed or

the upper limit value of the charging voltage changed by the charging amount changing means; and

injection timing determining means for calculating command injection timing at least based on the operating state or the operating condition of the engine and the charging speed or the upper limit value of the charging voltage to the piezo element changed by the charging amount changing means.

5. The fuel injection control system as in claim 4, wherein the injection period determining means includes injection period correcting means for contracting the command injection period as the charging speed or the upper limit value of the charging voltage changed by the charging amount changing means increases so that actual injection quantity, actual injection end timing or actual valve closing timing of the nozzle portion is unchanged even if the upper limit value of the charging voltage to the piezo stack is changed.

6. The fuel injection control system as in claim 4 or 5, wherein

the injection timing determining means includes injection timing correcting means for delaying the command injection timing as the charging speed or the upper limit value of the charging voltage changed by the charging amount changing means increases so that actual injection start timing or actual valve opening timing of the nozzle portion is unchanged even if the upper limit value of the charging

voltage to the piezo element is changed.

7. The fuel injection control system in claim 4, wherein the charging amount changing means increases or decreases the charging amount to the piezo element in accordance with the fuel pressure by changing target energy charged to the piezo element in accordance with the fuel pressure detected by the fuel pressure detecting means when the charging amount changing means changes the upper limit value of the charging voltage to the piezo element.